

Placer County Water Agency Middle Fork American River Project (FERC Project No. 2079)

DRAFT SEDIMENT MANAGEMENT PLAN



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List of Acronyms

ac-ft	acre-feet
AP	Avoidance and protection
BLM	Bureau of Land Management
BMPs	Best Management Practices
CDFG	California Department of Fish and Game
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
EAP	Emergency Action Plan
ENF	Eldorado National Forest
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FR	Forest Route
HPMP	Historic Properties Management Plan
MFP	Middle Fork American River Project
mm	millimeter
MW	megawatts
NGO	non-governmental organization
NTU	Nephelometric Turbidity Unit
PCWA	Placer County Water Agency
Project	Middle Fork American River Project
SMP	Sediment Management Plan
SPCCP	Spill Prevention Control and Countermeasure Plan
SPT	sediment pass through
State Water Board	California State Water Resources Control Board
TNF	Tahoe National Forest
USDA-FS	United States Department of Agriculture-Forest Service
VIPMP	Vegetation and Integrated Pest Management Plan

1.0 INTRODUCTION

This Sediment Management Plan (SMP) has been developed for the Placer County Water Agency (PCWA) Middle Fork American River Project (MFP or Project) located on the west slope of the Sierra Nevada range primarily within Placer County, California. The MFP is almost entirely in the Tahoe National Forest (TNF) and the Eldorado National Forest (ENF), with a small portion on PCWA-owned property. The MFP consists of two large storage reservoirs—French Meadows and Hell Hole (with a combined gross storage capacity of 342,583 acre-feet [ac-ft]); two medium reservoirs—Middle Fork Interbay and Ralston Afterbay; three small diversion pools—Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon; and five powerhouses (SMP Map 1). The Project began operations in 1967 and has a generating capacity of approximately 224 megawatts (MW). The Project also includes 21 developed recreation facilities concentrated near its storage reservoirs and diversion pools.

The SMP was developed during the relicensing of the MFP in consultation with representatives of federal and state resource agencies, Native American tribes, local and regional authorities, non-governmental organizations (NGO), and members of the public.

Sediment management is necessary at the Project's three small diversion pools and two medium reservoirs over the term of the new Federal Energy Regulatory Commission (FERC or Commission) license to maintain and protect system reliability including preserving full diversion capabilities, prevent damage to the turbines caused by coarse sediments entering the tunnels, and prevent sediment accumulation in the tailraces of powerhouses. SMP Table 1 summarizes existing Project facility infrastructure specifications at locations where sediment management will occur.

The SMP includes a description of sediment management activities necessary for continued operations of the Project at three small diversion pools and two medium reservoirs and associated measures to avoid and protect environmental resources. Sediment management activities described in this SMP include activities that are currently implemented by PCWA and future activities (i.e., gravel augmentation and sediment pass through) to be implemented during the term of the new license. In terms of sediment management at Ralston Afterbay, this SMP replaces the Ralston Afterbay Sediment Management Project Indian Bar Pilot Project (Jones and Stokes 2002).

Measures to protect cultural resources at locations where sediment management activities are implemented are provided in the Historic Properties Management Plan (HPMP) (PCWA 2010a; SD E). Measures to prevent the spread or introduction of noxious weeds are provided in the Vegetation and Integrated Pest Management Plan (VIPMP) (PCWA 2010b; SD A).

1.1 SMP ORGANIZATION

The SMP is organized into the following sections:

Section 2.0 SMP Objective: This section defines the purpose of the SMP.

Section 3.0 Sediment Management: This section defines sediment management activities to be implemented over the term of the license.

Section 4.0 Avoidance and Protection Measures: This section describes the approach for avoiding potential effects to environmental resources during implementation of sediment management activities.

Section 5.0 Monitoring, Reporting, and Agency Consultation: This section outlines monitoring and associated reporting that will be required over the term of the new license and describes agency consultation that would be conducted on an annual basis.

Section 6.0 Literature Cited: This section provides a list of documents or other resources that are referenced in the SMP.

2.0 SMP OBJECTIVE

The objective of the SMP is to define routine sediment management activities (including measures to avoid and protect environmental resources) that will be carried out for the MFP during the term of the new FERC license. Benefits of implementing the SMP include:

- Improved MFP system reliability;
- Reduced MFP facility maintenance;
- Increased natural delivery and transport of sediment (bedload and suspended load) downstream of Project diversions (small diversion pools and medium reservoirs); and
- Enhanced aquatic and riparian habitat downstream of Project diversions.

3.0 SEDIMENT MANAGEMENT

Sediment management at the small diversion pools (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon) and the medium reservoirs (Middle Fork Interbay and Ralston Afterbay) involves distinct approaches based on the feasibility of passing sediment downstream (SMP Figure1).

At the small diversion pools, infrastructure modifications that will allow bedload and suspended load to naturally be transported past the diversion facilities during high-flow events will be completed within four years following issuance of the new FERC license. During the interim years between license issuance and completion of the infrastructure modifications, active sediment removal by heavy equipment during the low-flow period (late summer or fall) will be implemented on an as-needed basis (interim sediment management). Although considered to be unlikely after completion of the infrastructure modifications, any accumulated sediment, woody debris, or vegetation within the existing diversion pools that restrict or threaten operations of the diversion facility or

natural transport of sediment downstream will be removed on an as-needed basis (contingency sediment management). Accumulated sediment within the existing diversion pools may also be recontoured to facilitate sediment transport or maintain facility function. All sediment removed during interim and contingency activities will be transported and stored at approved disposal areas.

At the medium reservoirs, infrastructure modifications to allow bedload material to pass naturally downstream are infeasible. Therefore, as part of routine sediment management, active sediment removal by heavy equipment is periodically necessary to allow safe and reliable operations of the Project during the term of the next license. During these removal activities, a portion of the sediment removed from the medium reservoirs will be placed at approved sites downstream of the dams within the high-water channel to allow subsequent high-flow events to transport the material naturally downstream (sediment augmentation). The excess sediment will be transported and stored at approved sediment disposal areas (sediment disposal).

Detailed descriptions of sediment management activities at each of the diversion facilities are provided in Sections 3.1 and 3.2. Specific Avoidance and Protection (AP) measures, including Best Management Practices (BMPs), are contained in Section 4.0. Monitoring, reporting, and agency consultation associated with sediment management activities are described in Section 5.0.

3.1 SMALL DIVERSION POOLS

Sediment has been routinely excavated on an as-needed basis (generally after episodic high-flow events) from the three small diversion pools at Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek. A summary of historic sediment management activities at the diversion pools is provided in SMP Table 2 and in Section 3.0. The following describes the activities that will be implemented over the term of the new license including: (1) interim sediment management; (2) infrastructure modifications and maintenance; (3) and contingency sediment management. The timing for implementation of each sediment management activity is provided in SMP Figure 1.

3.1.1 Interim Sediment Management

Interim sediment management may be necessary at the three small diversion pools prior to completion of the infrastructure modifications. The frequency of interim activities is dependant upon hydrological events, but could be expected to occur at least once at each of the small diversions based on Project history (SMP Table 1). The interim sediment management activities are focused on only removing sediments that are directly impacting the function of the Project diversion intakes, not removing accumulated sediment from the entire diversion pool. Therefore, the amount of material removed during interim sediment management is expected to be considerably less than historical sediment removal. Interim sediment removal activities are summarized in SMP Table 3. Interim sediment management activities are as follows:

- Diversion intake structures will be inspected each year to determine whether sediment removal is required.
- Planned sediment removal will occur during dry non-storm periods, typically in the late summer or fall. If a storm does occur, the work site will be secured and maintained to prevent erosion and discharge of sediment to the downstream channel.
- Temporary staging and non-construction vehicle parking will be at the existing diversion access roads. For Duncan Creek, this staging and parking area will be located between the bridge and disposal area; and for North Fork and South Fork Long Canyon it will be located on the northwest side of their respective diversion (SMP Maps 2 and 3).
- Traffic control will consist of temporary construction signs, trucks entering roadway signs, and flaggers, as needed. No road closures will be required.
- Trucks and construction equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. No on-site fuel tanks will be used. All fueling operations and stationary gasoline or diesel-powered equipment (i.e., pumps) will have adequate local containment to protect against accidental spills or leaks.
- Prior to sediment removal activities, the diversion pools will be dewatered. A gravity-fed streamflow bypass system will be installed to capture and divert flow around the work area and discharge water downstream of the dam to comply with minimum instream flow requirements. Seepage pumps will be placed in the diversion pools to keep the work area free from ponded water. The capacity of each bypass system will be designed to handle up to 150% of the flow anticipated during August and September.
- If fish are present within the small diversion pools during dewatering, fish will be rescued and transported downstream of the diversion. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies following completion of sediment management.
- After the bypass is installed and operable, excavation of sediment will begin. Equipment access will be via the existing access ramps. The amount of equipment used depends on the amount of material to be moved. Typical equipment to be used includes an excavator (e.g., Hitachi EX 550 or John Deere JD690), loader (e.g., Cat 966), and a small bulldozer (e.g., Cat D4). The excavator and loader will be used for primary excavating and loading equipment, and the small bulldozer will perform the more intricate grading and recontouring work. A large bulldozer will also be likely used at the sediment disposal area to place, spread, and compact the sediment. Hauling will be done with on-road dump trucks.

- Temporary access roads exist at all three diversions, but will require minor grading to improve the road surface for ingress and egress of excavation and hauling equipment.
- An Emergency Action Plan (EAP), required under 18 CFR Part 12, and a Spill Prevention Control and Countermeasure Plan (SPCCP) and Fire Plan, required under Section 10(c) of the Federal Power Act (FPA), will be prepared prior to implementation of sediment removal.
- Secondary containment will be provided for diesel and gas-powered equipment. Containment will be provided by installation of an oil absorbent boom downstream of the dam.
- Sediment excavated from the diversions will be hauled to approved disposal areas. The disposed sediment will be placed and graded to allow for easy access as borrow material by the United States Department of Agriculture Forest Service (USDA-FS), if requested, or will be contoured to a natural grade with erosion control measures consistent with USDA-FS BMPs (USDA-FS 2000). The location and available capacities of the disposal areas are summarized in SMP Table 3.
- Interim sediment management activities will be carried out at each of the small diversions until the infrastructure modifications are fully implemented as depicted in SMP Figure 1.

3.1.2 Infrastructure Modifications and Maintenance

Infrastructure modifications at the small diversions include retrofitting the existing structures with a self-cleaning, wedge-wire screen intakes. The wedge-wire screen intake is a stream bottom intake screen that allows water to be diverted and mobilized sediments to naturally be transported downstream. A detailed description of the infrastructure modifications and operations and maintenance is provided in Exhibit E, Section 4.0 – Proposed Action.

3.1.3 Contingency Sediment Management

Although considered to be unlikely once infrastructure modifications are fully operational, contingency sediment management activities may be required during the term of the next license. Contingency sediment removal activities are summarized in SMP Table 3.

Contingency sediment management activities are as follows:

- The diversion facilities will be inspected annually to determine if contingency activities are required.

- Accumulated sediment, woody debris, and/or vegetation within the existing diversion pool that restricts or threatens operations of the diversion facility or natural sediment transport downstream will be removed or recontoured on an as-needed basis during the dry non-storm periods (typically in the late summer or fall).
- Heavy equipment will be used within the diversion pool boundary to recontour sediments within the existing diversion pool to facilitate sediment transport and/or maintain facility function. These activities will be conducted consistent with the methods described above under Interim Sediment Management (Section 3.1.1).
- Sediment excavated from the diversions will be hauled to an approved disposal area. After placing and compacting the sediment, erosion control measures consistent with USDA-FS BMPs will be implemented. The locations of the disposal areas and available capacities are summarized in SMP Table 3.
- Large woody debris removed during contingency activities will be placed downstream of the diversion or disposed of at an approved disposal area.

3.2 MEDIUM RESERVOIRS

Sediment has been routinely excavated on an as-needed basis (generally after episodic high-flow events) from the two medium reservoirs, Middle Fork Interbay and Ralston Afterbay. Accumulated sediment not immediately affecting Project operations is typically removed during scheduled maintenance outages, which generally occur from late September through October. A summary of historic sediment management activities at these reservoirs is provided in SMP Table 2 and described in Exhibit E, Section 3.0 – No-Action Alternative. Refer to SMP Figure 1 for the timing for implementation of these activities. Past removal actions have included excavation of accumulated sediment using heavy equipment and disposal at approved sites. The following describes routine sediment management activities to be implemented at medium reservoirs during the term of the new license.

3.2.1 Middle Fork Interbay

Routine sediment management activities in Middle Fork Interbay are required over the term of the new FERC license to allow for continued operations of the MFP. These activities include:

- Physical removal of accumulated sediment within the reservoir using heavy equipment;
- Placement of sediment downstream of the dam to enhance natural sediment delivery and transport (augmentation); and
- Disposal of the remaining sediment at an approved sediment disposal area.

In addition, spillway gates will be opened in anticipation of, and during high-flow events, to prevent overtopping, facility damage, and facilitate passage of floating debris and suspended sediment. The following describes each component of routine sediment management at Middle Fork Interbay.

Sediment Removal

Routine sediment removal activities in Middle Fork Interbay will be necessary on an as-needed basis to allow for safe and reliable operations of the MFP. Expected removal volumes, as well as, timing, duration, and other specific details associated with removal activities are summarized in SMP Table 4. Routine sediment removal activities at Middle Fork Interbay are as follows:

- Temporary staging and non-construction vehicle parking will be located at existing Project parking areas adjacent to the Middle Fork – Ralston Tunnel Intake and Gatehouse, and the Middle Fork Powerhouse and Upper and Lower Switchyards (SMP Map 4). Equipment will be parked within the work area, out of the active river channel.
- Trucks and equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. A temporary fuel tank, meeting all state and federal regulations, will be placed near the Middle Fork Interbay Sediment Disposal Area (SMP Map 4). All fueling operations and stationary compressors or generators will have adequate local containment to protect against accidental spills or leaks.
- At the start of the maintenance outage period, the reservoir will be partially drained by shutting down generation at the Middle Fork Powerhouse and continuing to generate at Ralston Powerhouse. The remaining water will be drained to the spillway crest via a radial gate.
- A temporary instream flow bypass system designed for 150% of the flow anticipated during September and October will be installed. The bypass system will accommodate all minimum instream flow requirements. The system will include:
 - Removal of the log boom;
 - Installation of submersible pumps and generators;
 - Installation of a small diversion upstream of the powerhouse tailrace, where year-round streamflows enter the reservoir; and
 - Installation of approximately 2,000 feet of bypass pipe along Middle Fork Interbay Dam and Powerhouse Road to divert streamflow around the work area.

- To ensure reliability of the stream diversion system, a backup pump and backup generator will be provided. An automatic transfer switch will be installed, to allow the backup generator to start automatically, if the primary generator fails. Also, the work area will be manned 24 hours per day, during operation of the bypass system.
- When the bypass system is operational, the permanent instream flow bypass pipe in the dam will be shut off, and the remaining water in the reservoir will be drained into the Middle Fork – Ralston Tunnel at the tunnel intake structure. A submersible pump will be installed at the lowest point of the reservoir to pump any leakage water into the tunnel and keep the work area as dry as possible. Leakage water will be pumped into a settlement basin or filtration device, prior to being pumped into the tunnel.
- If fish are present within Middle Fork Interbay during dewatering, fish will be rescued and transported downstream of the sediment augmentation area and associated silt fence. In addition, fish present at the sediment augmentation area will be rescued and transported downstream of the silt fence. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies following completion of sediment management.
- After the bypass is installed and operable, excavation of sediment will begin. Equipment access will be via the existing access ramp at the north end of the dam. Secondary access will be just downstream of the powerhouse. The extent of equipment to be used depends on the amount of material to be moved. Typical construction equipment to be used includes excavators (e.g., Hitachi EX 550 or John Deere JD690), loaders (e.g., Cat 966), large bulldozer (e.g., Cat D8), and small bulldozers (e.g., Cat D4). The large excavators, bulldozers, and loaders will be used for excavating and loading equipment, and the small bulldozers will be used for the more intricate grading and slope work.
- Prior to hauling on public roads, traffic control consisting of active flagging and road warning signs will be installed. During hauling activities, the sediment disposal routes as shown on SMP Map 4 will be closed. This route includes Middle Fork Interbay Dam and Powerhouse Road from the Middle Fork Interbay Sediment Disposal Area to the Middle Fork Powerhouse (SMP Map 4).
- Sediment will be hauled to the approved disposal area by articulated 25- to 35-ton haulers (e.g., Volvo A35-C) or off-highway rock haulers (e.g., CAT 769C). Traffic patterns will be optimized to most efficiently and safely handle the loads. A large bulldozer will likely be used at the sediment disposal area to place, spread, and compact the sediment.

- Sediment excavated from the reservoirs will be hauled to an approved sediment disposal area or placed downstream of the dam (see Sediment Augmentation below). The disposed sediment will be graded to provide easy access for use as borrow material by the USDA-FS, or will be contoured to a natural grade. After placing and compacting the sediment, erosion control measures consistent with USDA-FS BMPs will be implemented. Existing sediment disposal area locations and available capacities are summarized in SMP Table 4.
- Upon completion of work activities in the reservoir, all disturbed areas will be regraded and all equipment will be removed. The reservoir water level will be brought up slowly, using inflow from the Middle Fork American River and water passed through the Middle Fork Powerhouse. After the clarity of the water is determined to be acceptable, as described in Section 5.1.2, the permanent instream flow valves will be opened. At this point, the temporary bypass system will be dismantled and removed.
- The duration of the sediment removal activities will depend on the volume of sediment to be removed. However, work associated with sediment removal is expected to be completed within four to eight weeks.

Sediment Augmentation

Sediment augmentation into the Middle Fork American River downstream of Middle Fork Interbay is extremely challenging because of the steep canyon walls and limited access. Construction of an access ramp from Middle Fork Interbay Dam and Powerhouse Road to the river is not feasible. As a result, sediment augmentation will be accomplished by releasing material from the Middle Fork Interbay Dam and Powerhouse Road, just downstream of the dam's north abutment, allowing it to accumulate in the river channel (SMP Map 4). The two augmentation areas are approximately 150 feet downstream of the dam and were selected because of their sediment transport potential and proximity to sediment removal activities.

Use of these two augmentation areas will follow a phased approach in consultation with the resource agencies. The site closest to the dam will be the primary sediment augmentation area. The second, downstream area will be used only after the primary area is full and monitoring has confirmed that sediment is successfully recruited. Both areas have similar capacities and sediment transport capabilities.

During the initial sediment removal action after implementation of the FERC license, approximately 5,000–8,000 cubic yards of removed sediment will be placed in the river at the primary sediment augmentation area. This method of augmentation simulates small slides that occur naturally in the watershed both upstream and downstream of the dam.

Selection of sediment for placement downstream (augmentation) will be based on particle size analysis completed in the field prior to sediment removal activities. Field samples will be collected using hand tools and a backhoe as necessary at a minimum of

five locations within removal area. The material in the pits will be photographed and visually catalogued. Representative samples will be placed on tarps and allowed to drain for approximately one hour, then sieved to determine particle size characteristics. Sampling will be supervised by a qualified geotechnical professional, and results will be used to identify the appropriate size material to be used for augmentation.

Using the information from the gradation tests and visual inspection, sediment will be preferentially selected within the preferred spawning particle size requirements as follows:

- Percentage finer than 1 millimeter (mm) should be less than 14%; and
- Percentage finer than 6.4 mm should be less than 30%.

All large cobble and boulders in excess of 7 inches will be removed to ensure that the material placed in the downstream channel will be mobilized during moderate to high flow events. Sediment in excess of 7 inches, or with excessive fines, will be hauled to an approved sediment disposal area.

To protect the roadway and embankment from damage, rubber matting or metal plates will be used at the augmentation area, extending approximately 20 to 30 feet down the slope. During the placement of material, instream flows and water quality will be protected by installing a temporary bypass from the dam to a point downstream of the augmentation area. A silt screen will also be placed downstream of the augmentation area to capture any fine sediment. Once augmentation is complete, the bypass pipe will remain in place for three days, or until water quality in the adjacent channel meets background levels, whichever comes first. At that time, the silt screen will be removed along with any captured sediment, followed by removal of the bypass pipe.

The secondary, downstream augmentation area will be used after monitoring of the primary sediment augmentation area has been completed (described in Section 5.1.3), and agency consultation has confirmed that augmentation material has mobilized to downstream reaches. If approved, both augmentation areas then would be used in subsequent removal actions. Similar monitoring and reporting requirements will be implemented for both sites, as described in Section 5.0.

Vegetation near the toe of the augmentation areas will be removed annually to allow for mobilization of augmentation material. Vegetation removal will be completed as described in the VIPMP.

Sediment Disposal

Sediment removed from Middle Fork Interbay that is not placed at the augmentation area will be transported to an approved disposal area. The designated disposal area for Middle Fork Interbay is the Middle Fork Interbay Sediment Disposal Area located 2.8 miles from Middle Fork Interbay on Middle Fork Interbay Dam and Powerhouse Road (SMP Map 4). The remaining capacity at this site is approximately 20,000 cubic yards (SMP Table 4). The average volume of sediment removed per sediment

management activity at Middle Fork Interbay is expected to be approximately 36,000 cubic yards (SMP Table 2). Therefore, additional disposal area(s) will be identified and developed in consultation with the appropriate resource agencies.

3.2.2 Ralston Afterbay

Routine sediment management activities in Ralston Afterbay are required over the term of the new FERC license to allow for continued operations of the MFP. These activities include:

- Physical removal of accumulated sediment within the reservoir using heavy equipment;
- Placement of sediment downstream of the dam to enhance natural sediment delivery and transport (augmentation); and
- Disposal of the remaining sediment at an approved sediment disposal area.

In addition, spillway gates are opened in anticipation of, and during high-flow events, to prevent overtopping, facility damage, and facilitate passage of floating debris and suspended sediment. Further, the low-level outlets may be opened to allow suspended sediment to be transported naturally downstream when the following conditions are met:

- Flow past the Ralston Afterbay Dam plus flow through Oxbow Powerhouse exceeds approximately 3,500 cubic feet per second (cfs), and
- PCWA staff has determined that the flow will be sustained for multiple days (based on weather forecasts).

The following describes routine sediment management activities at Ralston Afterbay.

Sediment Removal

Routine sediment removal activities in Ralston Afterbay will occur on an as-needed basis over the term of the new license. Expected removal volumes, as well as timing, duration, other specific details associated with removal activities are summarized in SMP Table 4. Routine sediment removal activities at Ralston Afterbay are as follows:

- Temporary staging and non-construction vehicle parking will be located at the Ralston Powerhouse Switchyard, Ralston Ridge Sediment Disposal Area, or at the Parking area north of Ralston Afterbay Dam. Equipment will be parked within these areas outside of the active river channel (SMP Map 5).
- Trucks and equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. A temporary fuel tank, meeting all state and federal regulations, will be located at the staging area north of Ralston Afterbay Dam (SMP Map 5). All fueling operations and stationary compressors or generators will have adequate local containment to protect against accidental spills or leaks.

- At the start of the maintenance outage period, the reservoir will be partially drained by shutting down generation at the Ralston Afterbay Powerhouse and continuing generation at Oxbow Powerhouse. The remaining water will be drained to the spillway crest via a radial gate.
- Once dewatered, large areas with accumulated sediment will be exposed throughout the reservoir and a low-flow channel will naturally develop in the reservoir. Due to the meandering nature of the low flow channel, the distance from the equipment access location, and the natural sediment size class distribution (sediment size generally decreases upstream to downstream), sediment will be removed from only the upper approximately one-half of Ralston Afterbay.
- A minimum of two river crossings, using large corrugated metal or plastic culverts backfilled with gravel and river sediments, will be established in the upper reservoir to allow sediment removal on both sides of the low-flow channel. These culverts will allow equipment to cross the active channel, to complete sediment removal activities, without diverting or pumping the low-flow channel. A medium-sized excavator (e.g., JD 690) will be used to install culvert crossings. The culverts will be designed for 150% of the flow anticipated during September and October, and will meet minimum instream flow requirements.
- After the culverts have been installed, excavation of sediment will begin. A small bulldozer (e.g., CAT D4) will be used for access road construction within the dewatered portions of the reservoir. A large excavator (e.g., Komatsu 750), supported by a large loader (e.g., Cat980), will remove the sediment and load it into the haul trucks.
- Sediment excavated from the reservoir will be hauled to an approved sediment disposal area or placed downstream of the dam (see Sediment Augmentation below). The disposed sediment will be graded to provide easy access for use as borrow material by the USDA-FS, or will be contoured to a natural grade. After placing and compacting the sediment, erosion control measures consistent with USDA-FS BMPs will be implemented. Existing sediment disposal area locations and available capacities are summarized in SMP Table 4.
- Prior to hauling on public roads, traffic control consisting of active flagging and road warning signs will be installed. During hauling activities, the sediment disposal routes as shown on SMP Map 5 will be closed. This route includes Ralston Ridge Road (Forest Route [FR] 23) from the Ralston Ridge Sediment Disposal Area to the intersection with FS 23.2 (road to the Indian Bar Sediment Disposal Area), and FS 23.2 to Indian Bar Sediment Disposal Area (SMP Map 5).
- Sediment will be hauled to the approved disposal area by articulated 25- to 35-ton haulers (e.g., Volvo A35-C) or off-highway rock haulers (e.g., CAT 769C). Traffic patterns will be optimized to most efficiently and safely handle the loads.

- Upon completion of work activities in the reservoir, all disturbed areas will be re-graded. The reservoir water level will be brought up slowly using inflow from Middle Fork American and Rubicon rivers and water passing through Ralston Powerhouse.
- The duration of the sediment removal activities will depend on the volume of sediment to be removed. However, work associated with sediment removal is expected to be completed within four to eight weeks.

SEDIMENT AUGMENTATION

A portion of the sediment removed from Ralston Afterbay will be transported and placed at the existing Indian Bar Sediment Augmentation Area downstream of Ralston Afterbay Dam (SMP Map 5). The amount transported to this augmentation area will depend on the available capacity of the site at the time sediment removal activities are implemented.

A portion of Junction Bar will also be used for sediment augmentation (SMP Map 5). Junction Bar is located just north (downstream) of Indian Bar on the west bank on Bureau of Land Management (BLM) land. Junction Bar will be accessed via a temporary construction bridge that will be placed at the north end of Indian Bar, and span the active channel. The bridge will be a railcar type structure, with a span of approximately 90 to 120 feet. The temporary bridge and abutments will be designed to withstand construction and hauling loads, and include side rails and closed decking. A temporary haul road will be constructed to connect the western bridge abutment to the augmentation area. After sediment placement, the temporary haul road, bridge and abutments will be removed and graded to match natural contours. Further development of this site will be done through consultation with the resource agencies.

Cultural and biological resource surveys have been completed at the site. The augmentation activities will not impact any cultural resources or special-status species. Placement of the temporary bridge would result in loss of approximately 0.38 acre of riparian habitat.

Selection of sediment for placement downstream (augmentation) will follow a similar procedure as described for Middle Fork Interbay (Section 3.2.1). Gradation testing will be done at each gravel bar to confirm size characterization, as well as visual inspection by a qualified geotechnical professional. Using the information from the gradation tests and visual inspection, sediment will be preferentially selected within the preferred spawning particle size requirements as follows:

- Percentage finer than 1 mm should be less than 14%; and
- Percentage finer than 6.4 mm should be less than 30%.

All large cobble and boulders in excess of 7 inches will be removed to ensure that the material placed in the downstream channel will be mobilized during moderate to

high-flow events. Sediment in excess of 7 inches, or with excessive fines, will be hauled to an approved sediment disposal area.

Augmentation material will be placed close to the river's edge in a manner that will maximize sediment transport during high-flow events. At the Indian Bar Sediment Augmentation Area, the sediment will be placed on the bar and then graded to the river's edge. Compaction will be kept to a minimum and end dumping will be avoided. Following high-flow events greater than 3,500 cfs, field observations will be conducted to estimate the volume of sediment transported from the site. If a substantial amount of sediment has been mobilized from the site (based on agency consultation), re-grading will be scheduled to facilitate sediment transport during subsequent high-flow events.

Augmentation replenishment is using previously removed and temporarily stored sediment to backfill augmentation areas where sediment has been recruited during high flow events. Replenishment will be developed through consultation with the resource agencies. Replenishment frequency and volume will be based on sediment transport monitoring of the augmentation areas (Section 5.1.3). Replenishment material will have been previously sorted based on gradation testing and visual inspection by a qualified geotechnical professional during sediment removal. The sediment appropriate for replenishment will be set aside at approved sediment disposal areas for future use. Sediment replenishment will be placed at the augmentation areas as previously described.

Vegetation near the toe of the augmentation areas will be removed annually to allow for mobilization of augmentation material. Vegetation removal will be completed as described in the Vegetation and Integrated Pest Management Plan.

SEDIMENT DISPOSAL

Sediment removed from Ralston Afterbay and not suitable for augmentation will be transported to an approved sediment disposal area. The current designated disposal area for Ralston Afterbay is the Ralston Ridge Sediment Disposal Area located approximately three miles from Ralston Afterbay via FR 23 (SMP Map 5). The site is an engineered basin prepared for sediment disposal associated with operations and maintenance of the MFP. The remaining capacity at this site is approximately 20,000–25,000 cubic yards. The average volume of sediment removed per sediment management activity at Ralston Afterbay is expected to be approximately 48,700 cubic yards. Sediment in excess of the remaining capacity at the existing disposal area will be disposed of at an approved disposal area(s) to be developed in consultation with resource agencies.

4.0 AVOIDANCE AND PROTECTION MEASURES

AP measures were developed to address potential Project-related effects resulting from implementation of sediment management activities including potential effects to water quality (including erosion, sedimentation, or hazardous materials) and biological resources (including riparian habitats and sensitive plants and wildlife species). This

section also includes measures to prevent fires and to protect public/worker health and safety. In general, the approach for avoiding potential effects to resources during implementation of sediment management activities was to develop measures that:

- Define limited operating periods;
- Establish contingency plans in the event of hazardous spills or fires; and
- Incorporate appropriate USDA-FS BMPs.

Refer to SMP Table 5 for a list of AP measures to be implemented for sediment management activities at small diversion pools and medium reservoirs. If appropriate, measures to be implemented during sediment management to protect cultural resources are defined in the HPMP (PCWA 2010a; SD E). Measures to prevent the spread or introduction of noxious weeds during sediment management activities are defined in the VIPMP (PCWA 2010b; SD A).

5.0 MONITORING, REPORTING, AND AGENCY CONSULTATION

The following section describes monitoring, reporting, and agency consultation requirements.

5.1 MONITORING

Turbidity and sediment monitoring will be conducted during implementation of sediment removal at small diversions and at sediment augmentation areas and medium reservoirs. Each of these is described below.

5.1.1 Turbidity Monitoring at Small Diversion Pools

Turbidity sampling will be conducted during both interim and contingency sediment removal activities at each of the small diversion pools according to the following protocols.

- Turbidity sampling will be initiated at least two hours prior to setting up the streamflow bypass or initiating any ground disturbing activities within the diversion pool. Sampling will continue for six hours after completion of the sediment removal activities, including after removal of the streamflow bypass system.
- Turbidity grab samples will be collected at one location immediately upstream and one location downstream of the diversion pools (i.e., within 200 feet) during sediment removal activities.
- Three grab samples will be collected at each location at a frequency of once every two hours.

- Grab samples will be labeled and tested immediately following collection using a hand-held meter (e.g., Hach 2100p turbidimeter). Results will be recorded on data sheets including date, time, identification number, turbidity reading, name of sampling personnel, weather conditions, and other pertinent information as required.
- Should the average of the downstream turbidity samples exceed 25 Nephelometric Turbidity Units (NTU) or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.
- Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes for three hours after work resumes to ensure compliance. After which, sampling will return to once every two hours.

5.1.2 Turbidity Monitoring at Medium Reservoirs

Turbidity sampling will be conducted during routine sediment removal activities at each of the medium reservoirs according to the following protocols.

- Turbidity sampling will be initiated at least two hours prior to installation of the streamflow bypass system or culverts (Middle Fork Interbay and Ralston Afterbay, respectively) or prior to initiating any ground disturbing activities. Sampling will continue for six hours after completion of the sediment removal activities, including after removal of the streamflow bypass system or culverts.
- Turbidity grab samples will be collected upstream and downstream of each medium reservoir during sediment removal activities including:
 - Middle Fork Interbay
 - In the Middle Fork American River immediately upstream of the streamflow bypass system; and
 - In the Middle Fork American River immediately downstream of the streamflow return system and sediment augmentation areas.
 - Ralston Afterbay
 - In the Middle Fork American River adjacent to the Ralston Picnic Area;
 - In the Rubicon River immediately upstream of Ralston Powerhouse;
 - In the Middle Fork American River immediately upstream of the Indian Bar Sediment Augmentation Area (augmentation area);

- In the Middle Fork American River immediately downstream of the Indian Bar Sediment Augmentation Area; and
 - Immediately upstream and downstream of any future sediment augmentation area.
- At each location, three grab samples will be collected at a frequency of once every two hours during sediment removal or augmentation activities.
 - Grab samples will be labeled and tested immediately following collection using a hand-held meter (e.g., Hach 2100p turbidimeter). Results will be recorded on data sheets including date, time, identification number, turbidity reading, name of sampling personnel, weather conditions, and other pertinent information as required.
 - Should the average of the downstream turbidity samples exceed 25 NTU or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.
 - Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes for three hours after work resumes ensuring compliance. After which, sampling will return to once every two hours.

As part of the Ralston Afterbay Sediment Management Project Indian Bar Pilot Project (Jones and Stokes 2002), turbidity monitoring is to be conducted in conjunction with the sediment pass through (SPT) component. If continuous, or real-time, turbidity monitoring related to SPT has not been completed prior to issuance of the new license; PCWA will implement turbidity monitoring as described in the Pilot Project for the initial SPT event.

5.1.3 Sediment Transport Monitoring at Augmentation Areas

Monitoring of sediment mobilized during high flows will be conducted at the sediment augmentation areas on the Middle Fork American River below Middle Fork Interbay and Ralston Afterbay. The purpose of the monitoring is to characterize the amount of sediment that was mobilized from the augmentation area downstream, and to monitor any potential build-up of boulders or sediment in the adjacent low-flow channel. The monitoring will be conducted according to the following protocols.

- After completion of sediment augmentation activities, the amount of sediment present at each location will be estimated based on: (1) records of truck trips during sediment removal activities, and (2) visual estimates below Middle Fork Interbay (due to access limitations) and physical measurements below Ralston

Afterbay. Photo documentation will also be completed at each augmentation area.

- The amount of sediment mobilized from the augmentation areas during high-flow events will be determined by comparing estimates of the remaining sediment at each site (using visual and physical measurement) with previous estimates. These surveys will be completed in the summer, in years when flows below the reservoir exceed initiation of motion estimates in the channel (550 cfs below Middle Fork Interbay and 7,000 cfs below Ralston Afterbay).

If excessive aggradation or armoring of the low-flow channel is evident, based on size class of the surface material in the vicinity of the augmentation area, the armor layer will be removed using equipment and transported to an approved disposal area.

5.2 REPORTING

After each sediment management activity, a report will be prepared describing the following:

- Sediment management activity implemented;
- Sediment disposal volumes (including augmentation volume if applicable), disposal location, and haul routes; and
- Turbidity or sediment transport monitoring results.

The report will be submitted to California State Water Resources Control Board (State Water Board), California Department of Fish and Game (CDFG), TNF, and ENF within four months of completion of the sediment management activity for a 60-day comment period. Comments received from the agencies will be incorporated, as appropriate, in a draft final report. The draft final report will be submitted to FERC for approval.

5.3 CONSULTATION

PCWA will conduct annual consultation with resource agencies. The purpose of this consultation will be to review and discuss the following:

- Discuss planned sediment management activities;
- Identify new sediment disposal and/or augmentation areas;
- Review and discuss agency comments on draft monitoring reports;
- Review and discuss any new records of special-status species where sediment management is implemented; and
- Evaluate the need to modify avoidance and protection measures.

Following completion of annual consultation, a letter will be prepared and submitted to FERC showing proof of consultation.

6.0 LITERATURE CITED

Jones and Stokes. 2002. Ralston Afterbay Sediment Management Project Indian Bar Pilot Project. Prepared for PCWA, August 2002.

Placer County Water Agency (PCWA). 2010a. Historic Properties Management Plan. Available in PCWA's Application for New License – Supporting Document E.

_____. 2010b. Vegetation and Integrated Pest Management Plan. Available in PCWA's Application for New License – Supporting Document A.

USDA-FS. 2000. Water Quality Management for Forest System Lands in California, Best Management Practices.

TABLES

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented.

Duncan Creek Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	32 ft
Dam Crest Length	165 ft
Volume	1,750 cubic yards
Elevation of Dam Crest	5,275 ft
Elevation of Streambed	5,243 ft
Elevation of Spillway Crest	5,265 ft
Stream Maintenance Pipe Capacity (10-in pipe)	8 cfs
Maximum Low-Level Outlet Capacity (60-in pipe)	310 cfs
Spillway	
Type	Uncontrolled Overflow
Width	100 ft
Capacity	7,200 cfs
Reservoir	
Gross Storage	20 ac-ft
Duncan Creek – Middle Fork Tunnel	
Nominal Size/Shape	9 ft x10 ft/Horseshoe
Length:	
Total	7,864 ft or 1.5 miles
Concrete Lined (Est.)	300 ft
Maximum Diversion Capacity	400 cfs
Invert Gradient	0.0029
North Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam above Streambed	10 ft
Dam Crest Length	120 ft
Elevation of Dam Crest	4,720 ft
Elevation of Streambed	4,710 ft
Volume	636 cubic yards
Stream Maintenance Pipe Capacity (12-in pipe)	2 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	100 cfs

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

North Fork Long Canyon Diversion (continued)	
Spillway	
Type	Uncontrolled Overflow
Elevation of Spillway Crest	4,716 ft
Width of Spillway Crest	95 ft
Capacity	3,000 cfs
Reservoir	
Gross Storage	<1 ac-ft
North Fork Long Canyon Diversion Pipe and Drop Inlet	
Pipe	
Diameter	36 in
Length	3,530 ft or 0.7 miles
Shaft	
Diameter	6 ft
Depth without 6 ft x 20 ft Standpipe	403 ft
Capacity	100 cfs
Invert Gradient	Vertical
South Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	27 ft
Dam Crest Length	145 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,623 ft
Volume	1,341 cubic yards
Stream Maintenance Pipe Capacity (12-in pipe)	5 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	140 cfs
Spillway	
Type	Uncontrolled Overflow
Width of Spillway Crest	60 ft
Elevation of Spillway Crest	4,640 ft
Capacity	4,000 cfs
Reservoir	
Gross Storage	<1 ac-ft
Diameter	6 ft
Depth without 6 ft x 6 ft Standpipe	387 ft
Capacity	200 cfs
Invert Gradient	Vertical

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Middle Fork Powerhouse (L.J. Stephenson Powerhouse)	
Penstock	
Length	3,653 ft or 0.7 miles
Diameter: Above Bifurcation	7 ft 6 in to 9 ft O.D.
Diameter: Below Bifurcation	5 ft 6 in O.D.
Powerplant	
Number of Units	2
Generator Installed Capacity (Total)	122.4 MW
Type of Turbine	Impulse
Elevation Nozzles	2,536 ft
Elevation Normal Tail Water Surface	2,529 ft
Maximum Static Head	2,096 ft
Minimum Static Head	1,806 ft
R.P.M.	400
Middle Fork Interbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	70.5 ft
Dam Crest Length	233 ft
Elevation of Dam Crest	2,536 ft
Elevation of Streambed	2,465 ft
Volume	14,360 cubic yards
Stream Maintenance Pipe Capacity	23 cfs
Low-Level Outlet Capacity at Water Surface 2530.0 (full reservoir)	890 cfs
Roadway Width, Curb to Curb	14 ft
Elevation of Roadway	2,538 ft
Spillway	
Type	Gated Ogee Crest
Capacity (Water Surface 2534)	36,506 cfs
Width of Spillway	80 ft Gated, 60 ft Uncontrolled
Number of Gates	4
Type of Gates	Radial
Size of Gates	20 ft x 20 ft
Elevation of Top of Gates	2,530 ft
Elevation of Sill of Gates	2,510 ft

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Middle Fork Interbay (continued)	
Impoundment	
Maximum Operating Water Surface	2,529 ft
Minimum Operating Water Surface	2,502 ft
Normal Operating Water Surface	2,527 ft
Gross Storage	175 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	2 ac-ft
Active Storage (as constructed)	173 ac-ft
Area at Maximum Operating Water Surface	7 acres
Area at Minimum Operating Water Surface	3 acres
Depth at Minimum Operating Water Surface	37 ft
Middle Fork – Ralston Tunnel	
Nominal Size/Shape	13 ft 5 in/Horseshoe
Length:	
Total	35,397 ft or 6.7 miles
Concrete Lined (Est.)	8,245 ft
Steel Lined (Est.)	245 ft
Maximum Discharge	836 cfs
Invert Gradient	0.0054
Ralston Powerhouse	
Penstock	
Length	1,670 ft
Diameter	8 ft to 9 ft 6 in O.D.
Powerplant	
Installed Capacity, Generator	79.2 MW
Type of Turbine	Impulse
Elevation Nozzles	1,186 ft
Static Head	1,344 ft
Maximum Flow	924 cfs
R.P.M.	240
Ralston Afterbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	89 ft
Dam Crest Length	560 ft
Volume	76,300 cubic yards
Elevation of Dam Crest	1,189 ft
Elevation of Streambed	1,100 ft

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Ralston Afterbay (continued)	
Dam (continued)	
Streamflow Maintenance Pipe Capacity (30-in pipe)	155 cfs
Maximum Low-Level Outlet Capacity at water surface 1179.0 (full reservoir) - calculated (72-in pipe)	1,132 cfs
Roadway Width, Curb to Curb	12 ft
Elevation of Roadway	1,188.42 ft
Spillway	
Type	Gated Ogee Crest
Capacity at Water Surface 1186	171,200 cfs
Elevation of Top of Gates	1,179 ft
Elevation of Sill of Gates	1,149 ft
Crest Length	232 ft
Number of Gates	5
Type of Gates	Radial
Size of Gates	30 ft x 40 ft
Impoundment	
Gross Storage	2,782 ac-ft
Active Storage	1,804 ac-ft
Ralston – Oxbow Tunnel	
Nominal Size/Shape	13 ft 3 in/Horseshoe
Length:	
Total	403 ft or 0.08 miles
Concrete Lined	343 ft
Steel Lined	60 ft
Maximum Discharge	1,088 cfs
Invert Gradient	0.12035
Oxbow Powerhouse	
Penstock	
Length	5 ft
Diameter	9 ft I.D.
Powerplant	
Installed Capacity, Generator	6.1 MW
Type of Turbine	Francis
Elevation Runner	1,098.5 ft
Static Head	90 ft
Normal Tail Water Surface	1,089 ft
Maximum flow	1,025 cfs
R.P.M.	200

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Summary	
Power and Energy Production	
Total Installed Capacity (at 0.9 power factor)	223.7 MW
Total Dependable Capacity (at 0.9 power factor)	224 MW
Average Annual Energy Production (Based on 38 years of operation: 1967–2004)	1,026,975 MWh
Maximum Total Static Head	4,162
Water Supply and Regulation	
Total Gross Storage	345,560 ac-ft
Project Features	
Earth and Rock Fill Dams	11,900,000 cubic yards
Concrete Dams and Diversions	94,000 cubic yards
Tunnels and Penstocks	23.2 miles

Notes :

ac-ft	=	acre-feet
cfs	=	cubic feet per second
ft	=	feet
I.D.	=	inside diameter
in	=	inch
MW	=	megawatt
MWh	=	megawatt hours
O.D.	=	outside diameter

SMP Table 2. Summary of Historic Sediment Removal Activities at MFP Diversion Pools and Medium Reservoirs (through 2009).¹

Year	Month ²	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
Duncan Creek Diversion Pool (period of record 1997-2009)		
1988	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1998	Aug	4,500
2007	Sept	1,570
Total		6,070
Frequency of Sediment Removal Activities: 3 times between 1988-2009 (22 years)		once every 7.3 years
Volume Removed per Maintenance Activity²		3,035 cubic yards
North Fork Long Canyon Creek Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1990	-	
1992	-	
1995	-	
1997	-	1,600
2004	Sept	400
2006	Sept	1,370
Total		3,370
Frequency of Sediment Removal Activities: 10 times between 1980-2009 (30 years)		once every 3 years
Average Volume Removed per Maintenance Activity²		1,123 cubic yards
South Fork Long Canyon Creek Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1995	-	
1997	-	
2006	Sept	2,850
Total		5,350
Frequency of Sediment Removal Activities: 7 times between 1980-2009 (30 years)		once every 4.3 years
Average Volume Removed per Maintenance Activity²		2,675 cubic yards
Middle Fork Interbay (period of record 1987-2009)		
1987	Oct	25,000
1988	Oct	35,000
1997	Feb	16,000
2000	Oct	68,000
Total		144,000
Frequency of Sediment Removal Activities: 4 times between 1987-2009 (23 years)		once every 5.8 years
Average Volume Removed per Maintenance Activity²		36,000 cubic yards
Ralston Afterbay (period of record 1969-2009)		
1969	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1981	Oct	10,000
1984	Oct	13,000
1985	Oct	12,000
1986	Mar	45,000
1986	Oct	80,000
1989	Oct	35,000
1994	Sept	77,000
1997	Feb	65,000
2002	Oct	101,000 ³
Total		438,000
Frequency of Sediment Removal Activities: 10 times between 1969-2009 (41 years)		once every 4.6 years
Average Volume Removed per Maintenance Activity²		48,667 cubic yards

¹Source: AQ 9 – Geomorphology Technical Study Report.²Includes only the years with known sediment volumes.³Volume equals 45,000 cubic yards compacted, in-place sediment at Indian Bar; and 29,000 cubic yards compacted, in-place sediment at Ralston Ridge.

SMP Table 3. Sediment Management at Small Diversions.

Interim and Contingency Sediment Management			
Sediment Management Details	Duncan Creek Diversion Pool	North Fork Long Canyon Diversion Pool	South Fork Long Canyon Diversion Pool
Start/End Dates	September through October	September through October	September through October
Duration	Interim Removal - 1.5 weeks Contingency Removal - 1 week	Interim Removal - 1 week Contingency Removal - 0.5 week	Interim Removal - 1 week Contingency Removal - 0.5 week
Work Days	5 to 8 days	3 to 5 days	3 to 5 days
Work Hours	7 am to 6 pm	7 am to 6 pm	7 am to 6 pm
Impact Area			
Site Access/Road Improvements	re-grade two 100-foot-long access ramp to diversion pool	re-grade 100-foot-long access ramp to diversion pool	re-grade 100-foot-long access ramp to diversion pool
Staging Areas (acres)	0.12	0.09	0.11
Materials			
Material Exported (cubic yards)	Interim Removal - 500 Contingency Removal - 100	Interim Removal - 200 Contingency Removal - 50	Interim Removal - 200 Contingency Removal - 50
Disposal			
Disposal Area	Duncan	North Fork Long Canyon Crossing Disposal Site	North Fork Long Canyon Crossing Disposal Site
Available Capacity (cubic yards)	20,000	10,000 to 20,000	10,000 to 20,000
Equipment/Personnel			
Equipment to be Used	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g., CAT D4); 1 backhoe; 2-3 haul trucks (10-ton); 1 water pumps	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g., CAT D4); 1-2 haul trucks (10-ton); 1 water pumps	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g., CAT D4); 1-2 haul trucks (10-ton); 1 water pumps
No. of People in Work Crew	8	6	6
No. of Haul Truck Trips	Interim Removal - 50 trips, twice in 5 years Contingency Removal - 10 trips, 5 times over 45 years	Interim Removal - 20 trips, twice in 5 years Contingency Removal - 5 trips, 5 times over 45 years	Interim Removal - 20 trips, twice in 5 years Contingency Removal - 5 trips, 5 times over 45 years
Crew Transportation To/From Site	Carpooling to/from Auburn	Carpooling to/from Auburn	Carpooling to/from Auburn
Crew Housing	Local residences	Local residences	Local residences
Channel Work			
Materials placed in streambed (fill in cubic feet)	50-100	50-100	50-100
Temporary Diversion/ Dewatering (method, materials)	Install temporary diversion structure at upstream end of reservoir to divert up to 5 cubic feet per second of flow around excavation area; pump water from excavation areas as needed	Install temporary diversion structure at upstream end of reservoir to divert up to 2 cubic feet per second of flow around excavation area; pump water from excavation areas as needed	Install temporary diversion structure at upstream end of reservoir to divert up to 3 cubic feet per second of flow around excavation area; pump water from excavation areas as needed

SMP Table 4. Sediment Management at Medium Diversions.

Routine Sediment Management		
Sediment Management Details	Middle Fork Interbay	Ralston Afterbay
Start/End Dates	September through October	September through October
Duration	4 to 8 weeks	4 to 8 weeks
Work Days	20 to 40 days	20 to 40 days
Work Hours	7 am to 6 pm	7 am to 6 pm
Impact Area		
Site Access/Road Improvements	Grade existing access ramp into reservoir	Construct haul road within dewatered reservoir
New Staging Areas (acres)	None (temporary staging and parking at existing sites at Middle Fork Gatehouse, and Powerhouse and Switchyards)	0.82
Materials		
Material Exported	36,000 cubic yards every 6 years	49,000 cubic yards every 5 years
Disposal Sites		
Disposal Location/Available Capacity	Middle Fork Interbay Sediment Disposal Area 20,000 cubic yards	Ralston Ridge Sediment Disposal Area 20,000 to 25,000 cubic yards
Augmentation Site/Available Capacity	Middle Fork Interbay Augmentation Area 5,000 cubic yards	Indian Bar Sediment Disposal Area 15,000 cubic yards
Equipment/Personnel		
Equipment to be Used	1 medium excavator (JD 690); 1 large loader (e.g., CAT 966); 1 medium bulldozer (CAT D8); 1 small bulldozer (CAT D4); 2-3 haul trucks (25-35 ton)	1 large excavator (e.g., Komatsu 750); 1 large loader (e.g., CAT 980); 1 medium excavator (JD 690); 1 small bulldozer (CAT D4); 2-3 haul trucks (25-35 ton)
No. of People in Work Crew	6 to 10	6 to 10
No. of Truck Trips	1,728 every 6 years	1,728 every 5 years
Crew Transportation To/From Site	carpooling from Auburn	carpooling from Auburn
Crew Housing	local residences	local residences
Channel Work		
Materials to be installed in streambed (fill in cubic feet)	500	3,500
Temporary Diversion/ Dewatering (method, materials)	~2,000 feet of pipe to bypass site to meet in-stream flow (discharge downstream of dam and augmentation area; small temporary dam across stream in dewatered reservoir to divert excess flow into existing tunnel;	CMP culverts for low flow channel in dewatered reservoir (capacity: 150% of expected flow); discharge downstream into lowered reservoir

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management.

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices					
Timing of Construction Activities (Practice 2-3). This BMP requires project proponents to minimize erosion by conducting operations during minimal runoff.					
<ul style="list-style-type: none"> The Licensee will conduct sediment management activities within the river and reservoir beds during minimal runoff periods (i.e., during the dry season or when rain and runoff are unlikely, typically during the late summer or fall). 	x	x	x	x	
<ul style="list-style-type: none"> Equipment will not be operated when ground conditions are such that excessive rutting and soil compaction could result. 	x	x	x	x	x
<ul style="list-style-type: none"> Equipment will be operated only on the dry and exposed reservoir or diversion pool bed, and will not enter wetted areas 	x	x	x	x	
<ul style="list-style-type: none"> Construction of drainage facilities or other work to control erosion or sedimentation will be required in conjunction with earthwork. 	x	x	x	x	x
Stabilization of Road Slope Surfaces and Spoil Disposal Areas (Practice 2-4): This BMP requires implementation of measures to minimize erosion from exposed slopes and spoil disposal areas.					
<ul style="list-style-type: none"> Bioengineering and other techniques will be implemented to prevent or minimize erosion, including vegetative or mechanical measures to improve surface soil stability. 	x	x	x	x	x
<ul style="list-style-type: none"> Revegetation including seeding of grasses, shrubs, or trees will be used as necessary to prevent or minimize erosion. A combination of woody and fibrous root systems usually produce the best results. All revegetation and seeding will be implemented in accordance with applicable USDA-FS policies (Refer to BMP 5-4). 	x	x	x	x	x
<ul style="list-style-type: none"> Mechanical measures including, but not limited to, wattles, erosion nets, terraces, mats, riprapping, mulch, soil seals, or coir rolls, may be used as necessary. 	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Stabilization of Road Slope Surfaces and Spoil Disposal Areas (Practice 2-4): This BMP requires implementation of measures to minimize erosion from exposed slopes and spoil disposal areas (continued).					
<ul style="list-style-type: none"> Silt fence and/or straw bales will be installed around the sediment storage sites, where turbid runoff could occur during rain storms. 					x
<ul style="list-style-type: none"> Slopes of the sediment piles at disposal areas will not exceed a 2:1 ratio. 					x
Servicing and Refueling of Equipment (Practice 2-12): This BMP requires implementation of measures to prevent pollutants (e.g., fuels, lubricants, or other hazardous materials) from being discharged into river, streams, or impoundments.					
<ul style="list-style-type: none"> The Licensee will develop a Spill Prevention, Containment and Counter Measures Plan (SPCC) that describes the emergency response to spills or discovery of hazardous materials (refer also to Practice 7-4, below). 	x	x	x	x	x
<ul style="list-style-type: none"> A designated fueling site, if necessary, will be established outside of the reservoir or diversion. Absorbent spill clean-up materials and spill kits will be available to absorb small spills. All used absorbent materials will be properly disposed of. 	x	x	x	x	
<ul style="list-style-type: none"> Temporary fuel tanks will have adequate local containment consisting of berms and plastic sheeting to protect against accidental spills or leaks. 	x	x	x	x	x
<ul style="list-style-type: none"> A spill response kit will be maintained at each site. 	x	x	x	x	x
<ul style="list-style-type: none"> If any accidental releases of sediment, fuels, or oil occur, immediate containment and cleanup will be implemented, and resource agencies notified in accordance with project permits. 	x	x	x	x	x
<ul style="list-style-type: none"> If fuel spills on the soil of the reservoir bed, the soil will be removed from the reservoir and properly disposed. 	x	x	x	x	

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Servicing and Refueling of Equipment (Practice 2-12): This BMP requires implementation of measures to prevent pollutants (e.g., fuels, lubricants, or other hazardous materials) from being discharged into river, streams, or impoundments (continued).					
<ul style="list-style-type: none"> Hazardous waste products such as grease cartridges and oil absorbents will be placed in proper containers and transported from the job site to an authorized Hazardous Waste Collections Site. 	x	x	x	x	x
<ul style="list-style-type: none"> All equipment will be thoroughly cleaned of dirt, grease, etc., prior to entering the National Forest, and will be inspected to ensure that is in proper functioning condition. All suspect hoses and hydraulic lines will be replaced prior to entering the National Forest. 	x	x	x	x	x
Controlling In-Channel Excavation (Practice 2-14): This BMP requires measures to minimize in-channel disturbances and associated sediment production.					
<ul style="list-style-type: none"> The area of disturbance within the river or reservoir bed will be limited to the minimum area necessary to implement sediment management activities. 	x	x	x	x	
<ul style="list-style-type: none"> After sediment removal, the channel or lake bottom will be restored to its original configuration, as applicable. 	x	x	x		
<ul style="list-style-type: none"> To protect the roadway and embankment from damage, rubber matting or metal plates will be used at the augmentation site, extending approximately 20 to 30 feet down the slope. (applicable to Middle Fork Interbay) 				x	
<ul style="list-style-type: none"> Disturbance of stream or lake banks will be kept to a minimum. Existing access ramps will be used to access the river or reservoir bed to the extent possible. 	x	x	x	x	
<ul style="list-style-type: none"> Disturbed banks will be stabilized as necessary. 	x	x	x	x	

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Diversion of Flows around Construction Sites (Practice 2-15): This BMP requires that stream diversions are carefully plan to minimize downstream sedimentation, and to restore stream channels to their natural grade, condition, and alignment as soon as possible.					
• Streamflow will be diverted during excavation of sediment.	x	x	x	x	
• Minimum instream flows levels will be maintained.	x	x	x		
• Diverted flows will be returned to their natural streamcourse as soon as possible after construction.	x	x	x	x	
• Disturbed areas will be stabilized as soon as possible.	x	x	x	x	
Revegetation of Surface Disturbed Areas (Practice 5-4): This BMP requires minimization of soil erosion through establishment and vegetation foliage and root networks.					
• Unstable or disturbed soil surfaces (i.e., on river or reservoir banks) will be revegetated as soon as possible.	x	x	x	x	
• The Licensee will implement all revegetation and seeding in conformance with USDA-FS revegetation and seeding policies. Refer to the Vegetation and Integrated Pest Management Plan.	x	x	x	x	
Forest and Hazardous Substance Spill Prevention Control and Counter Measure Plan (Practice 7-4):					
• USDA-FS requires preparation of an SPCC plan if total storage of fuel at the sites exceeds 660 gallons in single container, or if total storage exceeds 1,320 gallons.	x	x	x	x	x
• SPCC plans must be compatible with appropriate County SPCC Plans and California State guidelines.	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Fire Prevention and Protection Measures					
The provisions below outline the channels of responsibility for fire prevention and suppression activities, and established procedure in the event of a fire.					
<ul style="list-style-type: none"> The contractor, its employees, and subcontractors and their employees, will make all reasonable efforts to prevent and suppress wild fires, and will exercise diligence in protecting from damage the land and property of the United States. 	x	x	x	x	x
<ul style="list-style-type: none"> No burning of any kind will occur as part of sediment management activities. 	x	x	x	x	x
<ul style="list-style-type: none"> The following fire equipment will be on site at all times: <ul style="list-style-type: none"> One shovel, one axe and one fire extinguisher UL rated at 4 BC or more on each truck, personnel vehicle, tractor, grader, and any other heavy equipment used. One shovel and on back-pack five gallon water filled tank with pump with each welder. One shovel and one chemical pressurized fire extinguisher (fully charged) located at a point no greater than a distance of 25-feet from the work site, for each gasoline powered tool, including but not limited to chain saws, rock drills, etc. 	x	x	x	x	x
Air Quality Measures					
Fugitive Dust Reduction Measures					
<ul style="list-style-type: none"> Require contractors to comply with provisions of the Placer County Air Pollution Control District Rule 228 - Fugitive Dust, including Section 300 limits on visible emissions, PM10 concentrations, track-out onto paved public roadways, and other applicable requirements. 	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
Air Quality Measures (continued)					
Fugitive Dust Reduction Measures (continued)					
<ul style="list-style-type: none"> Stabilize unpaved areas subject to vehicle traffic by watering, treating with a non-toxic chemical dust suppressant, or covering. 	x	x	x	x	x
<ul style="list-style-type: none"> Limit the speed of any vehicles and equipment traveling across unpaved areas no more than 15 miles per hour unless the road surface and surrounding area is sufficiently stabilized. 	x	x	x	x	x
<ul style="list-style-type: none"> Stabilize storage piles and disturbed areas not subject to vehicular traffic by keeping wet, treating with a non-toxic chemical dust suppressant, or covering when material is not being added to, or removed from, the pile. 	x	x	x	x	x
<ul style="list-style-type: none"> Prior to any ground disturbance, including grading, excavating, and land clearing, apply sufficient water to the area to be disturbed to limit dust and minimize emissions from crossing the boundary line. 	x	x	x	x	x
<ul style="list-style-type: none"> Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt, from being released or tracked offsite. 	x	x	x	x	x
<ul style="list-style-type: none"> Remove significant accumulations of mud or dirt from paved, public streets at the end of each work day using wet sweeping or a HEPA filter equipped vacuum device. Do not use blower devices. 	x	x	x	x	x
<ul style="list-style-type: none"> Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the boundary line, despite the application of dust mitigation measures. 	x	x	x	x	x
<ul style="list-style-type: none"> Prevent spillage from materials transported off-site by either covering with tarps, or wetting loads such that the material does not touch the front, back, or sides of the cargo compartment at any point less than six inches from the top and that no point of the load extends above the top of the cargo compartment. 	X	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
Air Quality Measures (continued)					
Fugitive Dust Reduction Measures (continued)					
<ul style="list-style-type: none"> If any naturally occurring asbestos, ultramafic rock, or serpentine is disturbed: (1) wash all equipment before moving from the property onto a paved public road, and (2) upon completion of the project, stabilize disturbed surfaces using one or more of the following methods: (a) establishment of a vegetative cover; (b) placement of at least one foot of non-asbestos-containing material, or (c) paving. 	x	x	x	x	x
Diesel Emissions Reduction Measures					
<ul style="list-style-type: none"> Depending on equipment availability, require that all diesel construction engines with a rating of 50 horsepower or greater meet, at a minimum, the Tier 2 California emission standards for off-road engines (13 CCR 2423 per 40 CFR 89.112). 	x	x	x	x	x
<ul style="list-style-type: none"> Require contractors to limit idling of construction vehicles and equipment on site to 15 minutes or less, unless idling is necessary for effective work progress or equipment operation. 	X	x	x	x	x
<ul style="list-style-type: none"> Require contractors to maintain construction equipment in proper working order, and in accordance with manufacturer specifications. 	X	x	x	x	X
Fuel Emissions Measures					
<ul style="list-style-type: none"> Comply with the use of ultra-low sulfur diesel fuel for all construction equipment, as required by the state of California, to minimize diesel particular matter emissions. 	X	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
Public and Worker Safety Measures					
<ul style="list-style-type: none"> Material Safety Data Sheets for all substances used on the job site will be on file at the job headquarters in the Rock Creek Yard at Auburn, as required by the Hazard Communication Law, General Industry Safety Orders, Sec 5194, and will be available as necessary. 	x	x	x	x	x
<ul style="list-style-type: none"> Normal construction safety procedures, road signage, employee training and tailboards, and good housekeeping will be implemented to assure that no unseen safety hazards exist. 	x	x	x	x	x
<ul style="list-style-type: none"> Traffic control will consist of temporary construction signs, trucks entering roadway signs, and flaggers as needed. 	x	x	x	x	x
<ul style="list-style-type: none"> Road closures will be implemented as necessary during sediment removal and hauling. 			x	x	x
Biological Resource Measures					
General Biological Resource Measures					
<ul style="list-style-type: none"> Sediment management activities will be limited to the minimum area necessary for completion of the work, and will be confined to the diversion or reservoir channels and previously disturbed or developed upland areas. 	x	x	x	x	
<ul style="list-style-type: none"> All staging areas and access routes will be located on developed roads and previously disturbed areas (with the exception of temporary access to the Junction Bar Sediment Augmentation Area). 	x	x	x	x	x
<ul style="list-style-type: none"> Road resurfacing or other road maintenance necessary for ingress and egress of construction equipment will be confined to the existing road surfaces (with the exception of temporary access to the Junction Bar Sediment Augmentation Area). 	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

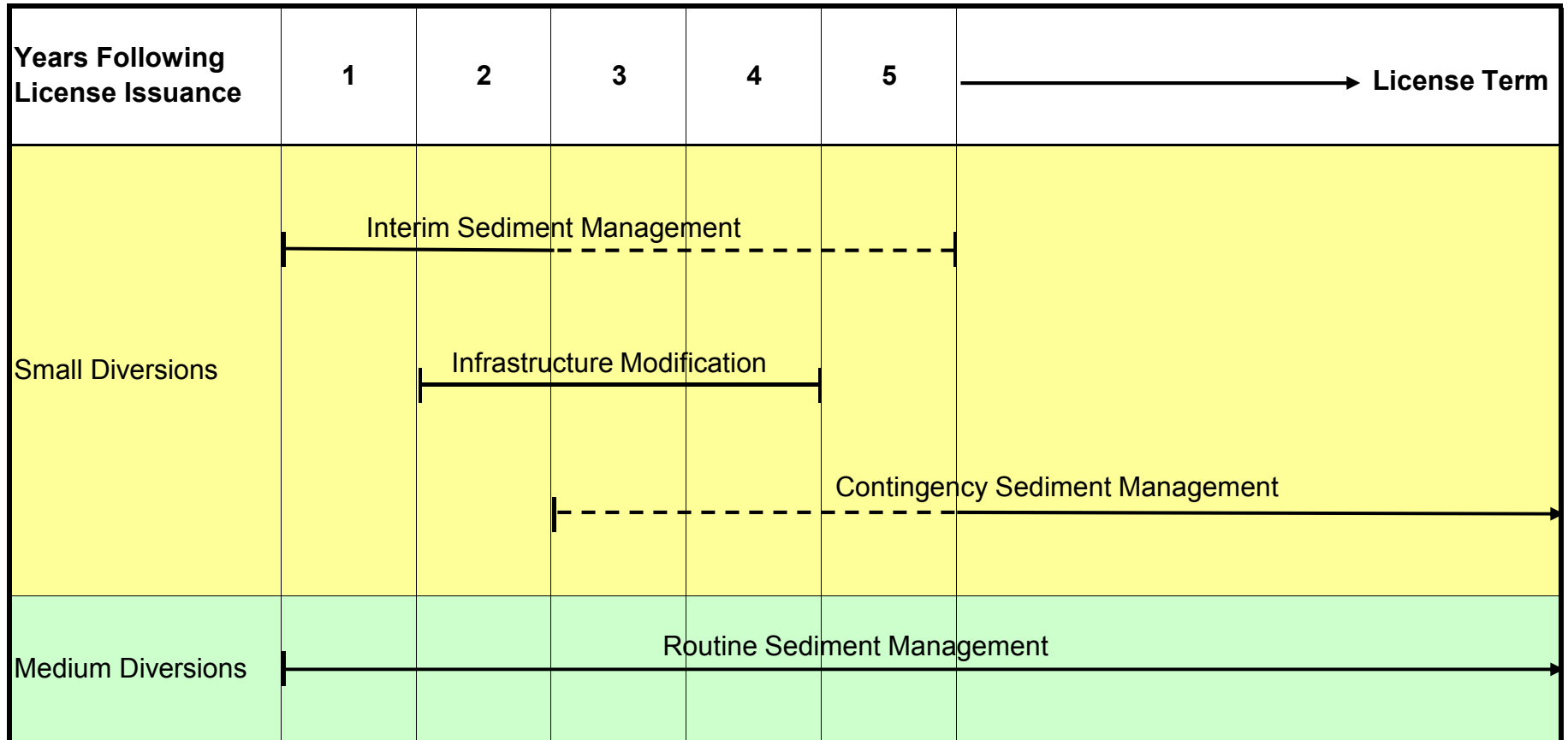
Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
Biological Resource Measures (continued)					
Noxious Weed Measures					
<ul style="list-style-type: none"> The Licensee will implement measures to prevent the introduction or spread of noxious weeds (as defined in the VIPMP) when conducting sediment management activities. 	x	x	x	x	x
Riparian Measures					
<ul style="list-style-type: none"> Riparian vegetation will not be removed or destroyed during implementation of sediment management activities (with the exception of one-time removal of riparian vegetation for the development of the Junction Bar Sediment Augmentation Area and removal of vegetation at the toe of the slope on Indian Bar). 	x	x	x	x	x
<ul style="list-style-type: none"> One-time removal of riparian vegetation at Indian and Junction bars will occur between August and March. 				x	
<ul style="list-style-type: none"> The Licensee will use existing ramps to access the reservoirs and diversion pools whenever possible. When it is not possible to use existing ramps, an access route will be selected in an area that does not support riparian vegetation. 	x	x	x	x	
Special-Status Plant Measures					
<ul style="list-style-type: none"> If a new special-status plant population that could be affected by sediment management activities is detected during the term of the license, the Licensee will consult with USDA-FS, USFWS, and CDFG, as appropriate, to determine a site-specific protective buffer around the population considering the special-status plant species, location of the population, and topography of the site. 	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
	Interim Sediment Management	Contingency Sediment Management	Routine Sediment Management		
			Sediment Removal	Sediment Augmentation	Sediment Disposal
Biological Resource Measures (continued)					
Aquatic Species Measures					
<ul style="list-style-type: none"> Check reservoirs during dewatering, transport stranded species. Prior to diverting or bypassing flows, all fish inhabiting the affected reach shall be captured and rescued to a downstream location. 	x	x	x	x	X
<ul style="list-style-type: none"> If fish are present within the small diversion pools during dewatering, fish will be rescued and transported downstream of the diversion. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies following completion of sediment management. 	x	x	x	x	x
<ul style="list-style-type: none"> If fish are present within Middle Fork Interbay during dewatering, fish will be rescued and transported downstream of the sediment augmentation site and associated silt fence. In addition, fish present at the sediment augmentation site will be rescued and transported downstream of the silt fence. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies following completion of sediment management. 	x	x	x	x	x
Raptor Measures					
<ul style="list-style-type: none"> Sediment management activities will be conducted after September 15 and before February 15 outside the raptor nesting season 	x	x	x	x	X

FIGURES

SMP Figure 1. Sediment Management Timeline.



MAPS